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Current Situations and Issues in the Management of Japanese University Spinoffs

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1. Introduction

University spinoffs in Japan only started to gain momentum in the latter half of the 1990s. While there were only approximately 30 startup companies in 1990, this number soared to 1,800 in 2008 (Japan Economic Research Institute, 2009). Supporting policies such as the “Hiranuma Plan” have assisted in the setting-up of over 1,000 university spinoffs in the 3 years since 2001.

However, university spinoffs in Japan have appeared to reach a tipping point in the latter half of 2000. The number of university spinoffs that have closed or become bankrupt has increased to the point that they surpass the number of newly-founded companies. Observations of yearly transitions show that the number of university spinoffs that reach IPO status have plateaued, and are in fact in a decreasing trend (Venture Enterprise Center, 2009). Furthermore, even among the university spinoffs that reach the IPO stage, there are many companies that experience sudden drops in stock prices immediately following IPO. It is therefore extremely rare for university spinoffs in Japan to mature in the same manner as those in the U.S., such as Global Enterprise.

The increase in the number of university spinoffs being founded fulfills policy objectives; however, from the perspective of the subsequent maturation and development of these companies, there appears to be a wall deterring the success of Japan’s university spinoffs.

In this study, a questionnaire survey was used targeting university spinoffs from Japan, and to a certain extent the U.K. and the U.S., in order to elucidate the main managerial challenges faced by Japanese university spinoffs: including “finding customers”, “raising finances”, “recruiting”, and “utilizing external resources”. In addition, I characterize the implications of these findings to the management of Japan’s university spinoffs.

2. The Definition of University Spinoffs

Academic research on university spinoffs began in the 1990s as a component of entrepreneurship research, and only fully developed into a new discipline in the 21st century. Based on a survey conducted by Djokovic and Souitaris (2006), there were 3 major perspectives for academic research concerning university spinoffs: The first is at the macro level, with the main approaches inclusive of “governmental and industrial support mechanisms in the spinout process”, and “technology and market-driven commercialization”. The second perspective is that at the meso level, with the main approaches inclusive of “university support mechanisms: incubators and technology transfer offices”, “university based determinants of spinout activity”, and “effectiveness of spinning out as a university technology transfer mechanism”. The third perspective is at the micro level, with main approaches inclusive of “role of founders and founding team during the spinout formation process” and “networks with university and industry”. However, there is no standardized definition for university spinoffs in these studies.

In 2005, the Japanese Ministry of Economy, Trade and Industry classified university spinoffs into the following categories: 1. Enterprises based on patents owned by the university, university employees or students; 2. Enterprises based on business methods and technology, but not on patents; 3. Others, which include 3.1: An enterprise that has conducted joint research with a university within 5 years of start-up in order to commercialize the know-how of the entrepreneur; 3.2: An enterprise that

has conducted joint research with a university within 5 years of start-up in order to sustain and develop existing operations; 3.3: An enterprise that has occupied a university-associated incubation institution within 5 years of start-up, and receives various types of support from the university; 3.4: An enterprise based on content learned from a university; 3.5: An enterprise founded on a business plan developed as part of venture business classes conducted in a university; 3.6: University spinoffs founded in order to provide funds for the transfer or commercialization of technology and know-how developed by a university; and 3.7: The majority of trade partners and sales are dependent on human resource connections of the entrepreneur's alma mater. According to Kondo, there are 3 types of university spinoffs: namely "transfer of human resources type, characterized by deep involvement of university academic staff, technical staff and students with the entrepreneur or start-up"; "transfer of technology type, characterized by enterprises founded based on results of research or technology from universities"; and "investment type, characterized by investments or procurement of investments by universities or related technology transfer office (TLO) during start-up (Kondo, 2002). In this way, we can see there is broad range of definitions of university spinoffs, in which the term refers to ventures that are supplied in any form with human resources, technology or funds from a university.

Smilor et al define university spinoffs as having founders that were academic staff, other staff or students from universities who have left the university in order to set up the spinoffs, or who have set up the spinoffs while still in the university. Also, university spinoffs may refer to those based on technology or technological ideas that have been developed in the university (Smilor et al., 1990). There are other definitions that place more emphasis on the human and technology relationships with universities (Nicolaou and Birley, 2003; Steffense et al., 1999). The definition provided by Robert (1991) emphasizes the university roots, as staff or student, of the founder, as well as the human relationship between the university and the venture.

Wright et al definition refers to university spinoffs as "new ventures that are dependent upon licensing or assignment of an institution's IP for initiation" (Wright et al., 2007), while Shane defines them as companies "founded to exploit a piece of intellectual property created in a academic institution" (Shane, 2004), and emphasize the technological and IP aspects of these enterprises. There are other definitions that focus on enterprises based on technology from universities (Charles and Conway, 2001; Yamada, 2006; Shindo, 2005).

In this study, I refer to university spinoffs as newly founded companies that have been formed based on intellectual properties from a university. Here, "intellectual properties" refers to not only patents with intellectual property rights guaranteed by law, but also research results in technology and know-how from universities that are not yet guaranteed by law.

3. Methodology

3.1. Sample

Using published company lists such as the Nihon Keizai Shinbun-Sha (2005), Japan Semiconductor Venture Association (2006), Journal of Pharmaceutical Business (2005); and web-based public information, I identified 1,289 ventures as candidate university spinoffs that had a technological-based relationship to universities. A questionnaire survey was sent to these 1,298

ventures by post from late April to early May, 2008; and 426 responses were received (Response rate: 32.82%) In early to late May 2008, we conducted a follow-up of companies that did not respond to the questionnaire survey by using e-mail or phone calls. Finally, from the responders to the survey, we identified and analyzed 234 companies that had been founded within the last 10 years and were based on legally protected intellectually property rights of a university in the form of patents or technology and know-how of a university that is not legally protected, or companies that have conducted joint research based on technology and know-how of a university.

In the case of the U.K., I used web-based public information on sites such as The United Kingdom Science Park Association, The United Kingdom Business Incubation, The Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom Universities UK office in order to identify candidate university spinoffs that had a technological-based relationship to universities The extracted ventures were then analyzed using questionnaires aimed at the individual universities or related science-park managers. These questionnaire surveys were sent by post from late November to early December 2005 to 851 ventures, and 74 responses were received (response rate 8.6%). In mid to late January 2006, we conducted a follow-up of companies that did not respond to the questionnaire survey by using e-mail or phone calls. From the responders to the survey, we identified and analyzed 10 companies that had been founded within the last 10 years and were based on legally protected intellectually property rights of a university in the form of patents or technology and know-how of a university that is not legally protected, or companies that have conducted joint research based on technology and know-how of a university².

With regard to university spinoffs in the U.S., I used web-based public information and phone calls to universities, government offices and private incubators to identify 916 candidate university spinoffs. These questionnaire surveys were sent by post in October 2006 to 916 ventures, and 117 responses were received by January 2007 (response rate 12%). In December 2006 to January 2007, we conducted a follow-up of companies that did not respond to the questionnaire survey by using e-mail or phone calls. From the responders to the survey, we identified and analyzed 56 companies that had been founded within the last 10 years and were based on legally protected intellectually property rights of a university in the form of patents or technology and know-how of a university that is not legally protected, or companies that have conducted joint research based on technology and know-how of a university.

3.2. Sample Characteristics

3.2.1 Business categories

The distribution of the samples by industry/business category is shown in Table 1. The percentage of biotechnology was shown to be very high among U.S. university spinoffs, and was also the most represented in Japanese and U.K. university spinoffs.

² The distribution of university spinoff samples in the U.K. were as follows: England 78.05% (London 2.44%, South east 9.76%, East 31.71%, South west 12.20% West midland 7.32%, East midland 7.32%, North west 7.32%, Yorkshire and North east 0%), Scotland 17.07%, Wales 2.44% and North Ireland 2.44%.

Table 1. Industry categories of the sample

		Japan (%)	U.K. (%)	U.S. (%)
Biotechnology		39.74	46.34	71.43
IT	Hardware	7.26	9.76	5.36
	Software	21.37	29.27	8.93
Others	Materials	14.53	0	17.86
	Machinery and Instrumentation	16.67	7.32	5.36
	Environmental	15.81	4.88	8.93
	Energy	8.97	2.44	7.14
	Education	-	0	1.79
	Others	10.26	14.63	14.29

Note: values are in percentages. N = 234 (Japan), 41 (U.K.), and 56 (U.S.). As there were university spinoffs that involved multiple industries, the total percentage > 100%.

3.2.2 Growth Stage at the Startup Year and Year of Study

Comparisons of the growth stages of the various university spinoffs from the 3 countries in our sample are shown in Table 2. The choices provided to the respondents in the questionnaire survey on the topic of growth stage were as follows: 1. Initial R&D stage; 2. Middle R&D stage; 3. Trial production and sales stage; 4. Initial production preparation stage; 5. Selling, but still loss stage within current year; 6. Selling and profitable, but accumulated loss (carried forward); 7. Selling and profitable, but accumulated loss (break even). In the sample, it appears that the Japanese university spinoffs in the sample are at a relatively later growth stage, followed by those of the U.K. and the U.S.

Table 2. Growth stage at the Startup year and Year of study

	Startup year	Year of Study
Japan	2.489 (1.666)	4.69 (1.695)
U.K.	2.474 (1.720)	4.079 (1.761)
U.S.	1.660 (1.108)	3.760 (1.582)

Note: Values are given as Mean (Standard Deviation). N = 234 (Japan), 41 (U.K.) and 56 (U.S.).

3.2.3. Managerial Challenges

A comparison between samples from Japan and the U.K. with regard to managerial challenges in the first year after start-up is shown in Tables 3 and 4. Respondents were allowed to choose 3 of the following choices representing these challenges in the questionnaire survey: 1. Recruiting, 2. R&D, 3. Raising finances, 4. Finding customers, 5. Securing offices or research laboratories, and 6. Maintaining relationship with a university.

In Japan, the predominant managerial challenge in the start-up year was raising finances, followed by recruiting and finding customers. The major challenge in the year of study was finding

customers, followed by raising finances and recruiting. In the U.K., the main managerial challenge at start-up was raising finances followed by recruiting and finding customers, which was the same as in Japan, while the main challenge currently was finding customers, followed by raising finances and R&D.

Table 3. Managerial challenges in the startup year

	Recruiting	R&D	Raising finances	Finding customers	Securing offices or research laboratories	Maintaining relationship with university
Japan	1.235 (1.108)	0.701 (1.038)	1.594 (1.271)	1.205 (1.208)	0.462 (0.855)	0.265 (0.74)
U.K.	0.659 (1.015)	0.683 (1.011)	1.927 (1.253)	1.000 (1.072)	0.366 (0.799)	0.463 (1.075)

Note: Values are given as Mean (Standard Deviation). N = 234 (Japan) and 41 (U.K.). The mean value was calculated based on the most difficult managerial challenge accounting for 3 points, the next challenge with a lower level of difficulty was 2 points, and the third challenge had 1 point.

Table 4. Managerial challenges in the year of study

	Recruiting	R&D	Raising finances	Finding customers	Securing offices or research laboratories	Maintaining relationship with university
Japan	1.491 (1.18)	0.701 (0.924)	1.496 (1.251)	1.517 (1.191)	0.192 (0.58)	0.111 (0.45)
U.K.	0.488 (0.978)	0.976 (1.06)	1.146 (1.352)	1.366 (1.22)	0.634 (1.067)	0.098 (0.374)

Note: Values are given as Mean (Standard Deviation). N = 234 (Japan) and 41 (U.K.). The mean value was calculated based on the most difficult managerial challenge accounting for 3 points, the next challenge with a lower level of difficulty was 2 points, and the third challenge had 1 point.

4. Managerial Challenge of Japanese University Spinoffs

In this study, a questionnaire survey was used targeting university spinoffs from Japan, and to a certain extent the U.K. and the U.S., in order to elucidate the main managerial challenges faced by Japanese university spinoffs: including “finding customers”, “raising finances”, “recruiting”, and “utilizing external resources”. “Finding customers” refers to problems with timing of implementation of customer or market research, while “raising finances” refers to the difficulties in raising equities and commercial financing when aiming for IPO status. “Recruiting” refers to the challenges associated in hiring executive staff and their business experience. “Utilizing external resources” is related to the relationship of trust and closeness, the knowledge of venture capitalists as investors, as well as the acquisition of networks, and sources of funding.

4.1. Finding Customers

4.1.1. Customer Types

Table 5 shows the responses in the questionnaire survey pertaining to customers of the university spinoffs. Choices for customers included universities, research institutes (other than universities), national/local governments, large enterprises, small and medium-sized enterprises, and consumers.

As seen in the table, large enterprises formed the majority of customers for Japanese university spinoffs, followed by small and medium sized enterprises. The customers for university spinoffs in the U.K. were similar to that of Japan, with large enterprises forming the majority, followed by small and medium sized enterprises and consumers. University spinoffs in the U.S. had large enterprises for the majority of their customers, followed by national/local governments and small and medium sized enterprises.

Table 6 shows the comparison of the breakdown of desired customers in the future by country. In Japan, the majority of these desired customers are the same as at present: large enterprises, followed by small and medium sized enterprises and universities. In the U.K., the majority of desired customers were large enterprises followed by small and medium sized enterprises and consumers. In the U.S., large enterprises were again the most desired customers, followed by consumers and small and medium sized enterprises.

When compared to the results seen in U.K. and U.S. university spinoffs, Japanese university spinoffs had a lower mean value for consumers as both current customers and desired customers in the future. On the other hand, university spinoffs from the U.K and the U.S. showed a marked contrast with consumers faring well as both current customers and desired customers in the future. Furthermore, while universities fared well as current customers and customers desired in the future for Japanese university spinoffs, they had the lowest scores for U.K. university spinoffs and also showed unfavorable scores for U.S. university spinoffs.

Table 5. Current customers

	Universities	Research institutes (except universities)	National / local governments	Large enterprises	Small and medium sized enterprises	Consumers
Japan	1.432 (0.496)	1.261 (0.44)	1.209 (0.408)	1.675 (0.469)	1.453 (0.499)	1.184 (0.388)
U.K.	1.122 (0.331)	1.146 (0.358)	1.195 (0.401)	1.732 (0.449)	1.244 (0.435)	1.22 (0.419)
U.S.	1.089 (0.288)	1.054 (0.227)	1.161 (0.371)	1.357 (0.483)	1.143 (0.353)	1.089 (0.288)

Note: Values are given as Mean (Standard Deviation). N=234(Japan), 41(U.K.), 56(U.S.). For mean values and standard deviations, a value of 2 = customer, while a value of 1 = non-customer.

Table 6. Desired customers in the future

	Universities	Research institutes (except universities)	National / local governments	Large enterprises	Small and medium sized enterprises	Consumers
Japan	1.368 (0.483)	1.329 (0.471)	1.286 (0.453)	1.739 (0.44)	1.479 (0.501)	1.239 (0.428)
U.K.	1.098 (0.3)	1.098 (0.3)	1.244 (0.435)	1.854 (0.358)	1.268 (0.449)	1.268 (0.449)
U.S.	1.054 (0.227)	1.036 (0.187)	1.125 (0.334)	1.393 (0.493)	1.161 (0.371)	1.357 (0.483)

Note: Values are given as Mean (Standard Deviation). N=234(Japan), 41(U.K.), 56(U.S.). For mean values and standard deviations, a value of 2 = desired customer in the future, while a value of 1 = not a desired customer in the future.

4.1.2. Implementation Timing for Market Research

The results of the questionnaire survey section regarding implementation timing for market research of main products and services are shown in Table 7. The choices available to the respondents were: 1. Initial R&D stage; 2. Middle R&D stage; 3. Trial production and sales stage; 4. Initial production preparation stage; 5. Selling, but still in a loss stage within the current year; 6. Selling and profitable, but accumulated loss (carried forward); 7. Selling and profitable, but accumulated loss (breaking even); and 8. Did not carry out market research

The results show that the implementation timing for market research in Japanese university spinoffs were at 2. Middle R&D Stage, and 3. Trial production and sales stage, with a mean value of 2.376. On the other hand, the implementation timing for market research in U.K. and U.S. university spinoffs were from 1. Initial R&D stage to 2. Middle R&D stage, with mean scores of 1.306 for the U.K. and 1.489 for the U.S. It therefore appears that conducting market research occurs later in Japanese university spinoffs than the other 2 countries in this study, with U.K. university spinoffs being the earliest. Furthermore, it was shown that the percentage of university spinoffs that declared no market research conducted was the highest in Japan at 17%, at more than thrice that of U.K. university spinoffs (4.9%) and twice that of U.S. university spinoffs (8.9%).

Table 7. Implementation timing for market research of main products or services

Japan	2.376 (1.339)
U.K.	1.306 (0.624)
U.S.	1.489 (0.895)

Note: Values are shown as Mean (Standard Deviation). N = 234 (Japan), 41 (U.K.) and 56 (U.S.). The numbers were based on the grading scale of 「1. Initial R&D Stage」 「2. Middle R&D stage」 「3. trial production and sales stage」 「4. initial production preparation stage」 「5. selling, but still loss stage

within current year」 「6. selling and profitable, but accumulated loss (carried forward)」 「7. selling and profitable, but accumulated loss (break even)」

4.2. Raising Finances

4.2.1. Main Difficulties in Raising Equity and Commercial Financing

The results of the questionnaire survey section regarding the main difficulties in raising equities and/or commercial financing are shown in Table 8. The choices available to the respondents were: 1. Initial R&D stage; 2. Middle R&D stage; 3. Trial production and sales stage; 4. Initial production preparation stage; 5. Selling, but still loss stage within current year; 6. Selling and profitable, but accumulated loss (carried forward); and 7. Selling and profitable, but accumulated loss (break even).

The results show that the stage at which Japanese university spinoffs faced the most difficulties in raising equities or finances in Japanese university spinoffs was in general later (mean: 3.192) compared to those of the U.K. (2.406).

Table 8. Stage in which most difficulties were faced in raising financing

	Japan	U.K.
1. Initial R&D stage	14.96	29.27
2. Middle R&D stage	28.21	24.39
3. Trial production and sales stage	14.1	7.32
4. Initial production preparation stage	12.39	2.44
5. Selling, but still loss stage within current year	17.09	12.2
6. Selling and profitable, but accumulated loss(carried forward)	3.42	0
7. Selling and profitable, but accumulated loss(break even)	4.7	2.44
Other, No answer	5.13	22
Mean value (SD)	3.192 (1.69)	2.406 (1.643)

Note: N = 234 (Japan) and 41 (U.K.). The numbers were based on the grading scale of 1. Initial R&D stage; 2. Middle R&D stage; 3. Trial production and sales stage; 4. Initial production preparation stage; 5. Selling, but still loss stage within current year; 6. Selling and profitable, but accumulated loss (carried forward); and 7. Selling and profitable, but accumulated loss (break even).

4.2.2. IPO

Table 9 shows the responses of Japanese and U.K. university spinoffs with regard to intentions for IPO. There were a combined 45.73% of Japanese university spinoffs that were in the “thinking about IPO” and “planning IPO” stages, which was slightly higher than that of U.K. university spinoffs (41.47).

Table 9. Plans for IPO

	No plans for IPO (%)	Thinking about IPO (%)	Planning IPO (%)
Japan	48.29	37.61	8.12
U.K.	56.1	36.59	4.88

Note: Values are percentages. N = 234 (Japan) and 41 (U.K.).

4.3. Recruiting

4.3.1. Recruiting Executive Staff

The results of the questionnaire survey regarding the recruitment of executive staff are shown in Table 10. Respondents were asked if they conducted recruitment activities for executive staff; namely chief executive officer (CEO), chief technology officer (CTO), chief financial officer (CFO), and chief sales officer (CSO).

36.75% of Japanese university spinoffs had conducted recruitment activities for CSOs, followed by CTOs (34.62%), CFOs (33.76%), and CEOs (16.24%). On the other hand, 68.29% of U.K. university spinoffs had recruited for CTOs, followed by CEOs (51.22%), CFOs (48.78%), and CSOs (46.34%).

Japanese university spinoffs, when compared to those of the U.K., do not appear to have an active recruitment drive for CEOs from external sources. The comparison between Japanese and U.K. university spinoffs with regard to the percentages of active external recruitment of executive staff is shown in Table 10.

Table 10. Recruitment of executive staff

	Chief Executive Officer (%)	Chief Technology Officer (%)	Chief Financial Officer (%)	Chief Sales Officer (%)
Japan	16.24	34.62	33.76	36.75
U.K.	51.22	68.29	48.78	46.34

Note: Values are percentages of the total sample. N = 234 (Japan) and 41 (U.K.).

4.3.2. The Business Experience of Executive Staff

The results of the questionnaire survey for Japanese university spinoffs regarding the business experience of the executive staff are shown in Table 11. Respondents were asked about the business experience of CEOs, CTOs, CFOs, and CSOs; whether that experience was in the same or different industry from the current industry; and whether the experience was gained in a listed or non-listed company.

A high percentage of CEOs did not have business experience (29.06%), followed by CEOs who had business experience in a listed company in another industry (21.37%). A high percentage of CTOs also did not have business experience (35.04), followed by those who gained experienced in a listed company in the same industry (15.81). A high percentage of CSOs had business experience in a non-listed company in another industry (24.79), followed by those with no business experience

(21.37). A high percentage of CSOs had business experience in a non-listed company in another industry (20.09), followed by those with no business experience (16.67).

The results show that in general, there were high percentages of CEOs and CTOs who had no experience, while high percentages of CFOs and CSOs had business experience in a non-listed company in other industries.

Table 11. The business experience of the management team

Chief Executive Officer (%)		Chief Technology Officer (%)	
No business experience	29.06	No business experience	35.04
Other industry, non-listed company	16.67	Other industry, non-listed company	11.97
Other industry, listed company	21.37	Other industry, listed company	14.1
Same industry, non-listed company	13.68	Same industry, non-listed company	10.26
Same industry, listed company	17.09	Same industry, listed company	15.81

Chief Financial Officer (%)		Chief Sales Officer (%)	
No business experience	21.37	No business experience	16.67
Other industry, non-listed company	24.79	Other industry, non-listed company	20.09
Other industry, listed company	20.09	Other industry, listed company	16.24
Same industry, non-listed company	7.69	Same industry, non-listed company	14.96
Same industry, listed company	5.98	Same industry, listed company	12.39

Note: Figures are percentages of the total sample. N = 234

4.4. Utilizing External resources

4.4.1. Relationship of Trust and Closeness

4.4.1.1. Relationship of Trust

With regard to relationships of trust with external resources, Japanese university spinoffs were queried on whether there was mutual exploitation of weaknesses and whether mutual promises were kept with each particular external resource. Choices available to respondents for external resources included universities, national/local agencies, venture capitalists, banks, lawyers, patent lawyers, accountants, and consultants.

It was found that regarding mutual exploitation of weaknesses, universities had the highest level of trust (mean value: 4.302), followed by national/local agencies (4.080) and patent lawyers (3.939). Universities (4.267) again had the highest level of trust with regard to the keeping of mutual promises, followed by national/local agencies (4.093) and accountants (3.894).

As such, we can see that universities had the highest level of trust with Japanese university spinoffs in both the mutual non-exploitation of weaknesses and keeping of mutual promises, followed by national/local agencies.

Table 12. Relationship of trust

No Exploitation of Mutual Weaknesses

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
4.302 (10.44)	3.412 (1.275)	3.802 (1.151)	3.939 (1.13)	3.894 (1.182)	3.436 (1.223)	3.493 (1.272)	4.08 (1.085)

Keeping Mutual Promises

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
4.267 (1.035)	3.542 (1.174)	3.962 (1.081)	4.069 (1.047)	4.092 (1.099)	3.521 (1.2)	3.734 (1.178)	4.093 (1.026)

Note: Values are shown as Mean (Standard Deviation), and based on a Likert scale where 1: Strongly Disagree and 5: Strongly Agree. N = 234

4.4.1.2. Closeness of the relationships with external resources

With regard to the closeness of the relationships with external resources, Japanese university spinoffs were queried on whether there were close business-based and personal-based relationships with each particular external resource. The choices for external resources were the same 8 choices described in the previous section.

Universities (mean value = 4.017) were found to be the closest business-based external resource with Japanese university spinoffs, followed by accountants (3.599) and patent lawyers (3.52). For closest personal-based external resources, universities had the highest mean value at 4.153, followed by accountants (2.986) and national/local agencies (2.972).

As we can see, universities were the closest external resource in both business and personal-based relationships. This was followed by accountants, patent lawyers and national/local agencies.

Table 13. Closeness of relationships with external resources

Closeness of Business Relationships

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
4.017(1.111)	2.798(1.63)	2.925(1.408)	3.52(1.306)	3.599(1.267)	2.356(1.362)	2.969(1.497)	3.346(1.401)

Closeness of Personal Relationships

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
4.153(1.163)	2.403(1.456)	2.624(1.423)	2.896(1.428)	2.986(1.429)	2.304(1.413)	2.648(1.43)	2.972(1.44)

Note: Values are shown as Mean (Standard Deviation), and based on a Likert scale where 1: Strongly Disagree and 5: Strongly Agree. N = 234

4.4.2. Knowledge Acquisition

4.3.2.1. Technological knowledge acquisition

Results of queries regarding the acquisition of technological knowledge from the collaboration with external resources are shown in Table 14. Questions were asked about which external resources were able to provide ample knowledge on technology, with the choices of external resources including universities, venture capitalists, banks, lawyers, patent lawyers, accountants, consultants and national/local agencies. Universities were found to support the most acquisition of knowledge on technology (mean value = 3.903), followed by national/local agencies (2.905) and patent lawyers (2.462).

Table 14. Acquisition of technological knowledge

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
3.903 (1.247)	2.221 (1.197)	2.092 (1.136)	2.462 (1.333)	2.281 (1.226)	2.247 (1.163)	2.023 (1.087)	2.905 (1.327)

Note: Values are shown as Mean (Standard Deviation), and based on a Likert scale where 1: Strongly Disagree and 5: Strongly Agree. N = 234

4.4.2.2. Market knowledge acquisition

Results of queries regarding the acquisition of market knowledge from the collaboration with external resources are shown in Table 15. Questions were asked about which external resources were able to provide ample market knowledge, with the choices of external resources including universities, venture capitalists, banks, lawyers, patent lawyers, accountants, consultants and national/local agencies.

Universities were found to support the most acquisition of knowledge on the market (mean value = 3.04), followed by national/local agencies (2.859) and patent lawyers (2.526)

Table 15. Acquisition of market knowledge

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
3.04 (1.323)	2.526 (1.274)	1.963 (1.018)	2.127 (1.124)	2.115 (1.112)	2.335 (1.227)	2.211 (1.112)	2.859 (1.329)

Note: Values are shown as Mean (Standard Deviation), and based on a Likert scale where 1: Strongly Disagree and 5: Strongly Agree. N = 234

4.4.3. Acquisition of Knowledge for Business Plan Development

Results of queries regarding the acquisition of knowledge for business plan development from the collaboration of Japanese and U.K. university spinoffs with external resources are shown in Table 16. With regard to the choices for external resources, banks, lawyers and patent lawyers were excluded based on results from a preliminary examination. As such, the choices provided to the respondents were universities, venture capitalists, accountants, consultants, national/local agencies family and friends; and two selections for enterprises that did not receive external advice, or did not

develop a business plan.

The results show that for Japanese university spinoffs, universities had the highest percentage (30.58%) for providing knowledge for developing business plans, followed by national/local agencies (29.34%) and venture capitalists (28.51%). For U.K. university spinoffs, venture capitalists had the highest percentage (36.59%) for providing knowledge for developing business plans, followed by national/local agencies (31.74%) and accountants (29.27%). The percentage of university spinoffs in Japan that did not get any advice for developing business plans from external sources from was twice than of the percentage of U.K. university spinoffs (19.01% vs 9.76%).

Table 16. Acquisition of knowledge for business plan development

	Universities	Venture Capitalists	Accountants	Consultants
Japan	30.58	28.51	17.77	16.94
U.K.	24.39	36.59	29.27	26.83
	National/Local Agencies	Family / Friends	No Advice Received	Did Not Develop Business Plan
Japan	29.34	14.05	19.01	3.31
U.K.	31.71	24.39	9.76	0

Note: Values are percentages of the total sample. N = 234 (Japan) and 41 (U.K.).

Japanese university spinoffs were found to be dependent on universities and national/local agencies for the acquisition of technological knowledge, market knowledge and knowledge for developing business plans. In the cases of market knowledge and knowledge for developing business plans, the third most important external resource was found to be venture capitalists.

The results of the questionnaire survey showed that the percentage of Japanese university spinoffs that did not get any advice for developing business plans from external resources from was twice than of the percentage of U.K. university spinoffs, and that in general, Japanese university spinoffs were less developed in collaborations with external resources for the acquisition of knowledge when compared to their U.K. counterparts.

4.4.4. Networking

4.4.4.1. Customer

Japanese respondents were queried about customer acquisition that arose from collaborations with external resources, i.e., they were asked to identify “external resources that introduced customers” to the enterprise. The choices for external resources were universities, venture capitalists, banks, lawyers, patent lawyers, accountants, consultants, and national/local agencies. The results (Table 17) show that universities were the most important external resource that introduced customers to the university spinoffs (mean value: 2.982), followed by national/local agencies (2.982) and venture capitalists (2.787).

Table 17. External resources that introduced customers

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
2.982 (1.286)	2.638 (1.302)	1.935 (1.01)	1.995 (1.034)	2.229 (1.157)	2.465 (1.191)	2.47 (1.206)	2.787 (1.228)

Note: Values are shown as Mean (Standard Deviation), and based on a Likert scale where 1: Strongly Disagree and 5: Strongly Agree. N = 234

4.4.4.2. Networks

Japanese respondents were queried about the acquisition of human networks that arose from collaborations with external resources, i.e., they were asked to identify “external resources that introduced networks” to the enterprise. The choices for external resources were identical to the 8 choices in the previous section. The results (Table 18) show that universities were the most important external resource that introduced human networks to the university spinoffs (mean value: 3.529), followed by national/local agencies (3.243) and venture capitalists (2.825).

Table 18. External resources that introduced networks

Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants	Consultants	Banks	National/Lo cal Agencies
3.529 (1.22)	2.825 (1.279)	2.261 (1.107)	2.356 (1.15)	2.58 (1.222)	2.683 (1.217)	2.656 (1.224)	3.243 (1.256)

Note: Values are shown as Mean (Standard Deviation), and based on a Likert scale where 1: Strongly Disagree and 5: Strongly Agree. N = 234

4.4.4.3. Hiring executive staff

Japanese and U.K. respondents were queried about the hiring of executive staff, i.e., they were asked to identify external resources that assisted in the search for CEOs, CTOs, CFOs and CSOs. The choices for external resources were universities, venture capitalists, national/local agencies, banks, lawyers, patent lawyers, accountants, consultants, human resource companies, and personal networks. Results for CEOs and CTOs are shown in Table 19, and results for CFOs and CSOs in Table 20.

Chief Executive Officer

For Japanese university spinoffs, it was found that personal networks accounted as the dominant external resource used for assisting in the recruitment of CEOs with a mean value of 9.4%, followed by universities (3.42%) and venture capitalists (5.56%). On the other hand, it was human resource companies that were most influential (24.39%) for assisting in the recruitment of CEOs for U.K. university spinoffs, followed by personal networks (19.51%) and universities (2.44%).

While human resource companies were the dominant external resource for assisting in the recruitment of CEOs in U.K. university spinoffs with 24.39%, there was a stark difference in Japanese university spinoffs where these companies accounted for 0%. Personal networks were the conspicuous external resource for recruiting CEOs in Japanese university spinoffs.

Chief Technology Officer

With regard to external resources that assisted in the recruitment of CTOs, personal networks accounted for the majority in both Japanese and U.K. university spinoffs (Japan: 23.08%, U.K.: 17.07%), followed by universities (Japan: 11.54%, U.K.: 14.63%) and human resource companies (Japan: 9.4%, U.K.: 9.76%).

Chief Financial Officer

With regard to external resources that assisted in the recruitment of CFOs, personal networks accounted for the majority in both Japanese and U.K. university spinoffs (Japan: 19.66%, U.K.: 31.71%), followed by human resource companies (Japan: 9.83%, U.K.: 17.7%) and venture capitalists (Japan: 8.97%, U.K.: 7.32%). While human resource companies were the 2nd most influential external resource for both Japanese and U.K. university spinoffs, the percentage in U.K. university spinoffs was almost twice that of Japanese university spinoffs.

Chief Sales Officer

With regard to external resources that assisted in the recruitment of CSOs, personal networks again accounted for the majority in both Japanese and U.K. university spinoffs (Japan: 29.91%, U.K.: 29.27%), followed by human resource companies (Japan: 8.97%, U.K.: 26.83%) and venture capitalists (Japan: 5.56%, U.K.: 2.44%). While human resource companies were the 2nd most influential external resource for both Japanese and U.K. university spinoffs, the percentage in U.K. university spinoffs was almost thrice that of Japanese university spinoffs.

Based on a questionnaire survey on Japanese university spinoffs regarding the network acquisition due to collaborations with external resources, universities were found to be the dominant source of providing networks for the acquisition of both customers and human networks, followed by national/local agencies and venture capitalists. On the other hand, university spinoffs in the U.K. were most reliant on human resource companies for assisting in the recruitment of executive staff, while personal networks had the most influence for the same purpose in Japanese university spinoffs.

Table 19. External resources that assisted in the recruitment of executive staff (CEO and CTO)

Chief Executive Officer (%)

	Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants
Japan	3.42	5.56	0.43	0	1.71
U.K.	2.44	17.07	—	0	—
	Consultants	Banks	HR Companies	National/Local Agencies	Personal Networks
Japan	1.28	1.71	0	1.71	9.4
U.K.	—	0	24.39	2.44	19.51

Chief Technology Officer (%)

	Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants
Japan	11.54	3.42	0	0	0
U.K.	14.63	0	—	0	—
	Consultants	Banks	HR Companies	National/Local Agencies	Personal Networks
Japan	1.28	0.43	9.4	2.14	23.08
U.K.	—	0	9.76	0	17.07

Note: Values are in percentages of the total sample. N = 234 (Japan) and 41 (U.K.).

Table 20. External resources that assisted in the recruitment of executive staff (CFO and CSO)

Chief Financial Officer (%)

	Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants
Japan	1.71	8.97	0.43	0	5.13
U.K.	0	7.32	—	7.32	—
	Consultants	Banks	HR Companies	National/Local Agencies	Personal Networks
Japan	2.14	2.99	9.83	4.7	19.66
U.K.	—	0	17.07	4.88	31.71

Chief Sales Officer (%)

	Universities	Venture Capitalists	Lawyers	Patent Lawyers	Accountants
Japan	2.99	5.56	0	0	0.43
U.K.	2.44	2.44	—	0	—
	Consultants	Banks	HR Companies	National/Local Agencies	Personal Networks
Japan	2.99	0.85	8.97	3.85	29.91
U.K.	—	2.44	26.83	0	29.27

Note: Values are in percentages of the total sample. N = 234 (Japan) and 41 (U.K.).

4.4.5. Sources of Funding

Results of queries to Japanese and U.K. university spinoffs regarding sources of funding sought and actual sources of funding are shown in Tables 21 and 22, respectively. Choices for sources of funds were venture capitalists, angel investors, private companies, friends, family, own capital, banks and government subsidies.

As seen in Table 21, self-funding (using own capital) was the most desired source of funding sought (1.634) by Japanese university spinoffs, followed by venture capitalists (1.487) and banks (1.482). Actual sources of funding (Table 22) were self-funding (1.608), followed by government subsidies (1.554) and venture capitalists (1.369).

For U.K. university spinoffs, the most desired source of funding sought (Table 21) was venture capitalists (1.683) followed by angel investors (1.561) and banks (1.439). Actual sources of funding (Table 22) were venture capitalists (1.561), followed by angel investors (1.488) and own capital (1.195).

In both Japanese and U.K. university spinoffs, the most desired source of funding sought and the main actual source of funding were identical – own capital for Japanese university spinoffs and venture capitalists for U.K. university spinoffs. U.K. university spinoffs tended to obtain the desired investments of risk capital from venture capitalists and angel investors, while those in Japan tended to use their own capital or government subsidies.

Table 21. Sources of funding sought

	Venture Capitalists	Angel Investors	Private Companies	Friends and Family	Own Capital	Banks	Governmen t Subsidies
Japan	1.487 (0.501)	1.295 (0.457)	1.411 (0.493)	1.393 (0.489)	1.634 (0.483)	1.482 (0.501)	1.679 (0.468)
U.K.	1.683 (0.471)	1.561 (0.502)	1.244 (0.435)	1.195 (0.401)	1.244 (0.435)	1.439 (0.502)	1.39 (0.494)

Note: Values are shown as Mean (Standard Deviation), and based on 2: Attempted to obtain funds from this source and 1: Did not attempt to obtain funds from this source. N = 234 (Japan) and 41 (U.K.).

Table 22. Sources from which funding were actually obtained

	Venture Capitalists	Angel Investors	Private Companies	Friends and Family	Own Capital	Banks	Government Subsidies
Japan	1.369 (0.484)	1.207 (0.406)	1.333 (0.472)	1.342 (0.476)	1.608 (0.489)	1.387 (0.488)	1.554 (0.498)
U.K.	1.561 (0.502)	1.488 (0.506)	1.122 (0.331)	1.146 (0.358)	1.195 (0.401)	1.146 (0.358)	0.293 (0.461)

Note: Values are shown as Mean (Standard Deviation), and based on 2: Actually obtained funds from this source and 1: Did not obtain funds from this source. N = 234 (Japan) and 41 (U.K.).

4.4.6. Knowledge from Investors and Network Acquisition

Japanese and U.K. university spinoffs that obtained funding from venture capitalists were queried about the type of support obtained (Table 23) and whether that support was helpful (Table 24).

Choices for support types were advice on business plan, support for distribution and sales, advice on personnel affairs, introduction to R&D staff, introduction to sales staff, introduction to executive staff, and did not receive any support other than the investment.

For Japanese university spinoffs, the most common type of support obtained from venture capitalists (Table 23) was advice on business plan (1.695), followed by support for distribution and sales (1.341) and advice on personnel affairs (1.293). The main type of helpful support (Table 24) was advice on business plan (1.533), followed by support for distribution and sales (1.280) and introduction to R&D staff (1.213).

For university spinoffs from the U.K., the most common type of support obtained from venture capitalists (Table 23) was advice on business plan (1.609), followed by advice on personnel affairs (1.217) and support for distribution and sales (1.341). The most helpful support (Table 24) was advice on business plan (1.478), followed by advice on personnel affairs (1.174) and introduction to R&D staff (1.341).

For both Japanese and U.K. university spinoffs, advice for business plans was the most common form of support obtained from venture capitalists, as well as being the most helpful.

Table 23. Support obtained from venture capitalists

	Knowledge acquisition			Recruitment			Others
	Business Plan	Distribution and Sales	Personnel Affairs	R&D Staff	Sales Staff	Executive Staff	Only Financial Support
Japan	1.695 (0.463)	1.341 (0.477)	1.293 (0.458)	1.268 (0.446)	1.11 (0.315)	1.061 (0.241)	1.183 (0.389)
U.K.	1.609 (0.499)	1.217 (0.422)	1.217 (0.422)	1.348 (0.487)	1.043 (0.209)	1.13 (0.344)	1.261 (0.449)

Note: values are presented as Mean (Standard Deviation), and based on 2: Support obtained from this source, and 1: No support obtained from this source. University spinoffs that did not answer or did not obtain funding from venture capitalists were excluded from this analysis.

Table 24. Helpful support obtained from external resource

	Knowledge acquisition			Recruitment		
	Business Plan	Distribution and Sales	Personnel Affairs	R&D Staff	Sales Staff	Executive Staff
Japan	1.533 (0.502)	1.28 (0.452)	1.187 (0.392)	1.213 (0.412)	1.107 (0.311)	1.053 (0.226)
U.K.	1.478 (0.511)	1.13 (0.344)	1.174 (0.388)	1.174 (0.388)	1 (0)	1 (0)

Note: values are presented as Mean (Standard Deviation), and based on 2: Helpful support obtained and 1: No helpful support obtained. University spinoffs that did not answer or did not obtain funding from venture capitalists were excluded from this analysis.

5. Results and Discussion

This study used a questionnaire survey targeted at university spinoffs from Japan, and to a lesser extent from the U.K. and U.S., in order to elucidate their main managerial challenges of “finding customers”, “raising finances”, “recruiting”, and “utilizing external resources”. “Finding customers” refers to problems with timing of implementation of customer or market research, while “raising finances” refers to the difficulties in raising equities and commercial financing when aiming for IPO status. “Recruiting” refers to the challenges associated in hiring executive staff and obtaining their business experience. “Utilizing external resources” is related to the relationship of trust and closeness, as well as knowledge and networking, while challenges in “raising finances” are related to the knowledge of venture capitalists as investors, as well as the acquisition of networks.

The results are summarized below.

5.1. Summary

5.1.1. Finding Customers

When compared to the U.K. and the U.S., Japanese university spinoffs had low mean values for consumers as current and desired customers in the future; and in fact consumers had the lowest mean values among the 6 choices available. On the other hand, consumers were the 3rd most important in U.K. university spinoffs for both current and desired future customers. In U.S. university spinoffs, consumers were the 3rd most important current customer and the 2nd most desired future customer. Universities were relatively more important to Japanese university spinoffs, as the 3rd most important customer and desired future customer. On the other hand, universities were the least important customer and desired future customer for U.K. university spinoffs; and in the case of U.S. university spinoffs, universities were the 4th more important customer and the 5th in the rank of desired future customers.

Next, Japanese university spinoffs were found to have later implementation timings of market research of main products, service market and customers. Furthermore, the percentage of Japanese university spinoffs that declared they did not conduct any market research on main products, service market and customers was thrice that of university spinoffs from the U.K., and twice that of those from the U.S.

5.1.2. Raising Finances

While Japanese university spinoffs faced most of their difficulties in raising equities and/or commercial financing during the Middle R&D stage, U.K. university spinoffs had the most difficulties in the Initial R&D stage. Also, Japanese university spinoffs had a higher mean value (3.192) for difficulties in raising equities and/or commercial financing than U.K. university spinoffs (2.406), implying that difficulties were faced at a later stage for the Japanese enterprises.

With regard to IPO intentions, the percentage of Japanese university spinoffs that were “thinking about IPO” or “planning IPO” (45.73%) was slightly higher than that of U.K. university spinoffs (41.47%).

5.1.3. Recruiting

When compared to U.K. university spinoffs, Japanese university spinoffs were less active in externally recruiting CEOs. Furthermore, Japanese university spinoffs also had a comparatively lower percentage of hiring executive staff, including CEOs, CTOs, CFOs and CSOs. We found that a high percentage of Japanese university spinoffs had CEOs and CTOs with “no business experience”.

5.1.4 Utilizing External resources

5.1.4.1. Relationship of Trust and Closeness

Universities were found to be the external resource with the closest business-based and personal-based relationships with Japanese university spinoffs, followed by accountants, patent lawyers, and national/local agencies.

5.1.4.2. Knowledge Acquisition

Japanese university spinoffs were found to be heavily dependent on universities and national/local agencies for the acquisition of technological knowledge, market knowledge and business plan development knowledge. In the case of acquisition of market knowledge and business plan knowledge, venture capitalists were the 3rd most important external resource.

The percentage of Japanese university spinoffs that did not obtain external advice developing business plans was twice that of U.K. university spinoffs. As such, the results of the questionnaire survey show that Japanese university spinoffs are less connected to external resources when compared to their U.K. counterparts.

5.1.4.3. Network Acquisition

It was found that universities, followed by national/local agencies and venture capitalists, were the most important external resource that supported customer acquisitions and human network acquisitions for Japanese university spinoffs. Human resource companies were the most important external resource for U.K. university spinoffs for the recruitment of executive staff, while personal networks were the most important for Japanese university spinoffs.

5.1.4.4. Sources of Funding

In both Japanese and U.K. university spinoffs, the most desired source of funding sought was identical to the main actual source of funding; own capital for Japanese university spinoffs and venture capitalists for U.K. university spinoffs. There was a trend observed in which U.K. university spinoffs tended to obtain the desired investments of risk capital from venture capitalists and angel investors, while their Japanese counterparts tended to rely on their own capital or government subsidies.

5.1.4.5. Knowledge from Investors and Network Acquisition

For both Japanese and U.K. university spinoffs that obtained support from venture capitalists, “advice for business plan” was the most important type of support and support that was recognized as helpful.

5.2. Discussion

5.2.1. Finding Customers

The questionnaire survey revealed that the customers of Japanese university spinoffs tended to be university-oriented, and not consumer-oriented. Furthermore, the implementation of market research for main products, services and customers were conducted later than their U.K. and U.S. counterparts, and many Japanese university spinoffs were found not to have conducted market research.

Rogers (1962) analyzed the diffusion process of new goods and services from a societal perspective, and discusses a diffusion model for innovation. He states that the process of innovation from introduction to diffusion can be separated into the following 5 groups of adopters: Innovators looking for products based on new technology; Early adopters who proactively understand and adopt the advantages that new products have; The early majority who place importance on the balance between price and quality; The later majority that become reassured enough to adopt the product after the majority of society has adopted the innovation; and Laggards. In 1991, Moore stated that there is a chasm in between the early adopters, and early majority described in Roger's model.

However, it appears that Japan's university spinoffs have not been able to overcome, or do not have the intention of overcoming, this chasm. In the case of the respondents of our questionnaire survey, innovators and early adopters may refer to relatively prestigious universities and enterprises with interests in technology, while the early majority and late majority may refer to consumers.

In an interview research of Japanese university spinoffs, it was found that while there were opinions that "the challenge is the shift of business from a research institute to a private company focused on consumers", there were also opinions of early adopters that "business is doing well as there are customers in both universities and research institutes" and "had no intentions of expanding the customer base due to costs of constructing an after service framework".

The uninterest of Japanese university spinoffs in consumers, or the early majority and late majority, is shown by the late implementation timings of market research for main products and service and the large number of enterprises that did not conduct market research when compared to U.K. and U.S. university spinoffs. In order to successfully attract consumers, the appeal of the innovativeness of technology alone is insufficient, and market research has to be conducted in order to understand what is necessary to acquire customer satisfaction. However, for Japanese university spinoffs which have not shown much interest in consumers, or the early and late majority, the necessity of this market research may be relatively small.

Furthermore, the interview study research also showed that there were Japanese university spinoffs that conducted market research due to the low costs and fast results from the Internet. However, there were also university spinoffs that mass marketing was not needed and instead focused on finding customers and marketing through customer introductions, and other university spinoffs that market research was not required at the moment as sales was outsourced.

This may be a contributing factor to explain why Japanese university spinoffs have never matured to a global enterprise, such as Google, Sun Microsystems and Genentech from the U.S.

5.2.2. Raising Finances

The results of this questionnaire survey have shown that from the stages of basic research to the business activities of development and scale-up in Japanese university spinoffs, there is a gap in sources of financing between government subsidies and private funding, i.e. the existence of the “Valley of Death” (Office of the Secretary U.S. Department of Commerce, 2002), which highlights the presence of problems in financing. The results, however, show a different situation for U.K. university spinoffs.

While U.K. university spinoffs had the most difficulties in raising equities and/or commercial financing during the Initial R&D stage, Japanese university spinoffs faced most of their difficulties during the Middle R&D stage. Also, Japanese university spinoffs had a higher mean value for difficulties in raising equities and/or commercial financing than U.K. university spinoffs, implying a later stage for the Japanese enterprises. This reflects a situation in which the financing of university spinoffs in Japan benefit from government subsidies in the early stages, and a shortfall of necessary private investments in later stages.

In an interview research with Japanese university spinoffs, the following opinions with respect to government subsidies were observed: “we want simpler application processes”, “we want a one-stop service for government subsidies”, and “we want better information provided to us”; however, there were virtually no complaints about the quantity of funding. On the other hand, with regard to venture capitalists, there were opinions that investment funding from venture capitalists was insufficient for operations, especially from new drug development companies. One company also reported that “we are only able to acquire one-fifth of our targeted funds. In comparison to the U.S. venture that is our business partner, we only obtain one-hundredth of their investment funds”.

This background may reflect the magnitude of the investment fund system geared towards ventures in Japan. The amount invested by Japan’s venture capitalists was about one-thirtieth that of U.S. and Europe venture capitalists in 2006, with the U.S. investing 28.6 trillion yen and Europe investing 33.4 trillion yen (Ministry of Economy, Trade and Industry ed., 2008). Also, angel investors play a very small role in Japan. According to the Ministry of Economy, Trade and Industry (2008), the taxation system for angel investors was founded, revised and expanded after 1997. This system was most heavily used in 2005, but even so the amount invested by angel investors during that year was slightly less than 25 billion yen. Also, while there are over 200 angel investor networks in both the U.S. and Europe, similar networks in Japan only number in the tens (Ministry of Economy, Trade and Industry ed., 2008).

In this environment of low investment funds from venture capitalists and angel investments, it appears that university spinoffs have very few choices for final exit. With regard to financing, there was a higher percentage of Japanese university spinoffs that had intention to obtain financing from IPO when compared to U.K. university spinoffs. These results suggested that Japanese university spinoffs might be comparatively more actively aiming for IPO status. However, this could be due to the lack of M&A as an outlet option.

An interview study conducted with U.K. university spinoffs showed that one enterprise felt that it was very common for big enterprises in the U.S. to buyout U.K./Cambridge startup companies, and

that it was natural to consider the sale of their own enterprise to global corporations as the dominant exit. On the other hand, an interview study with Japanese university spinoffs showed that while there were many opinions that “After achieving listing, aiming for the maturation of the enterprise” and “we are not considering the sale of our enterprise”, there were few enterprises with the opinion that “the sale of our enterprise is one of the available choices”. As such, Japanese university spinoffs appear to have a characteristic resistance to the sale of their enterprises. However, as they lack adequate M&A exit options, university spinoffs with intentions to mature have only one exit option open to them – that of IPO.

In an interview study of venture capitalists that have invested in university spinoffs, it was found that the exit option of M&A for university spinoffs is also recognized as a challenge in venture capitalist circles, and that many venture capitalist companies are in the process of building M&A-related networks and strengthening intermediacy. However, there was the opinion that a mismatched situation exists in which overseas enterprises understand and shown interest in Japan’s university spinoffs, while Japanese domestic enterprises have more interest in acquiring overseas ventures. For investors, a variety of exit options in university spinoffs are connected to a reduction in investment risks. As such, the lack of exit options for Japanese university spinoffs may influence available financing.

The challenges in financing Japan’s university spinoffs includes the scarcity of venture capitalists investments and angel investors, as well as the difficulties in acquiring investment funds due to the dearth of exit options for high-tech start-ups.

5.2.3. Recruiting

It is desirable for executive staff to have business experience that can result in a mutually complementary relationship with researchers in university spinoffs (Roberts, 1991; Chrisman et al., 1995). However, it would appear that the mutually complementary relationship does not exist between the executive staff and researchers in Japan’s university spinoffs. The results of the questionnaire survey show that there were low percentages of both external recruitment of CEOs and the CEOs with business experience. According to Value Management Inc. (2008), there are many university academic staff and researchers that assume the role of CEO in Japan’s university spinoffs, which has become a major challenge in the management of these enterprises.

A hearing research revealed that there are cases in which the executive staff of Japanese university spinoffs was composed entirely of fellow researchers. These cases are similar to ventures with executive staff comprised of relatives, and regardless of how highly evaluated the technology, there are opinions that these ventures would be poorly evaluated as far as investments are concerned. An interview study focused on researchers who founded university spinoffs in the U.S. revealed that many researchers who had never considered handling the management of the enterprise, as they considered themselves researchers. There were also cases when universities mediated the procurement of executive staff when researchers were considering start-up.

On the other hand, in an interview study on an industry-university collaboration departments revealed cases in which researchers had to assume the role of CEOs when decisions on personnel

affairs are made. There were also opinions that there are many researchers with education and training in management. A hearing research on the technology transfer offices of Japanese universities showed that there thought it prohibitively difficult to recruit high-caliber executive staff externally in Japan. Also, it was indicated by some respondents that while there were cases in which retired entrepreneurs were introduced by way of National/Local Agencies, it was extremely difficult to find excellent human resources with business experience in ventures. An interview study with university spinoffs showed that the acquisition of C-level executives is not only difficult, but also expensive. Failure to recruit the desired personnel is common even with the use of recruitment notices and participation in combined presentation meetings, therefore resulting in the meaningless loss of several million yen. Also, even when utilizing human resource companies, it is rare to be able to acquire the desired personnel. This indicates poor liquidity in the labor market in Japan, and difficulties in the external recruitment of candidate C-level executives.

5.2.4. Utilizing External resources

The results of the questionnaire survey on activities relating to external resources elucidated the following 4 points:

- (1) With regard to advice obtained from external resource regarding making business plans, the percentage of Japanese university spinoffs that did not receive any external advice was twice that of the U.K.
- (2) With regard to the recruitment of executive staff, U.K. university spinoffs were most dependent on human resource companies, while their Japanese counterparts were most dependent on personal networks.
- (3) With regard to desired sources of funding sought and the actual sources of funding, there was a large percentage of U.K. university spinoffs that were able to obtain the desired investments of risk capital from venture capitalists and angel investors, while there was a trend of U.K. university spinoffs obtaining the desired investments of risk capital from venture capitalists and angel investors, while their Japanese counterparts relied more on their own capital and government subsidies.
- (4) There is a high dependence of Japanese university spinoffs on universities for relationships of trust, closeness, knowledge, networks and funding.

Japanese university spinoffs were found to be dependent on personal networks and self-funding, and did not sufficiently utilize external resources. Even when external resources were utilized, these enterprises tended to be dependent on universities, giving rise to the concern that there are inadequate collaborations with other available resources.

Reference

- Charles David and Cheryl Conway (2001) Higher Education-Business Interaction Survey, Centre for Urban and Regional Development Studies, University of Newcastle upon Tyne.
- Chrisman James, Timothy Hynes and Shelby Fraser (1995) Faculty, Entrepreneurship and Economic Development: The Case of the University of Calgary, *Journal of Business Venturing*, 10, pp.267-281.
- Djokovic Djordje and Vangelis Souitaris (2006) Spinouts from Academic Institutions: a Literature Review with Suggestions for Further Research, *Journal of Technology Transfer*, 33(3), pp. 225-247.
- Japan Economic Research Institute Inc. ed.(2009) Daigaku-hatsu Bench ni kansuru Kisochoa Hokokusyo 2007(Basic Research Paper of Japanese University Spinoffs) (in Japanese).
- Japan Semiconductor Venture Association ed.(2006) Nihon hando-tai FPD Bench Nenkan 2006(Japan Semiconductor FPD Venture Yearbook), Japan Semiconductor Venture Association, (in Japanese).
- Journal of Pharmaceutical Business ed. (2005) Iyakuhin Bench Yoran (Pharmaceutical Venture Handbook), *Journal of Pharmaceutical Business*, (in Japanese).
- Kondo Masayuki (2002) Daigaku-Hatsu Bench no Ikusei Senryaku (Strategic Incubation for Venture Business from Universities), Chuou Keizai Press (in Japanese).
- Ministry of Economy, Trade and Industry ed. (2005) Daigaku-hatsu Bench ni kansuru Kisochoa Hokokusyo 2007(Basic Research Paper of Japanese University Spinoffs) (in Japanese).
- Ministry of Economy, Trade and Industry ed. (2008) Bench-kigyō no Soshutsu Seicho ni kansuru Kenkyukai Hokokusyo (Final Research Paper of Japanese Venture's Creation and the Growth) (in Japanese).
- Moore, Jeffrey A.(1991)Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Customers, New York, N.Y. : Harper Business.
- Nicolaou Nicos and Sue Birley (2003) Academic Networks in a Trichotomous Categorization of University Spinouts, *Journal of Business Venturing*, 18, pp.333–359.
- Office of the Secretary U.S. Department of Commerce(2002)The Advanced Technology Program: Reform with a Purpose.
- Nihon Keizai Shinbun-sha ed (2005) Nikkei Bench-Bijinesu –Daigaku-hatsu Bench Gaido-bukku-(Nikkei Ventures –University Spinoffs-), Nihon Keizai Shinbun-sha, (in Japanese).
- Roberts Edward (1991) *Entrepreneurs in High Technology*, New York, Oxford University Press.
- Rogers Everett M.(1962) *Diffusion of Innovations*, New York, NY: Free Press.
- Shane Scott (2004) *Academic entrepreneurship : University Spinoffs and Wealth Creation*, Cheltenham, Glos, U.K: Edward Elgar Publishing
- Shindo Haruomi (2005) Daigaku-hatsu-bench ni okeru Kigyōka-katsudo(Entrepreneurship in University Spin-offs), *Entrepreneurship Studies*, 2, pp.23-32, (in Japanese).
- Smilor Raymond, David Gibson and Glenn Dietrich (1990) University Spin-out Companies: Technology start-ups from UT-Austin, *Journal of Business Venturing*, 5(1), pp.63-76.
- Steffensen Morten, Everett Rogers and Kristen Speakman (1999) Spin-offs from Research Centers at a Research University, *Journal of Business Venturing*, 15, pp.93-111.

Value Management Inc. ed.(2008) Daigaku-hatsu Bench ni kansuru Kisochoa Hokokusyo 2007(Basic Research Paper of Japanese University Spinoffs) (inJapanese).

Venture Enterprise Center ed.(2009)Bench-Bijinesu no Kaiko to Tenbo(Review and Prospect of Japanese Ventures) (inJapanese).

Wright Mike, Bart Clarysse, Philippe Mustar and Andy Lockett (2007) Academic Entrepreneurship in Europe, Edward Elgar.

Yamada Jinichiro (2006) Hukakujitusei Taisyotositeno Kigyo-timu no Seitokakatsudo(Legitimizing Activity of Entrepreneurial Team against Uncertainties), Japan Ventures Review, 8, pp.23.32, (in Japanese).